United States Patent [19]

Hsiao

[11] **Patent Number: 4,821,547**

[45] **Date of Patent: Apr. 18, 1989**

[54] **WHEEL-DRIVING STRAIGHTENER FOR STRAIGHTENING LONGITUDINAL CYLINDRICAL MEMBER**

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[21] Appl. No.: **138,967**

[22] Filed: **Dec. 29, 1987**

[51] **Int. Cl.**[4] **B21D 3/00**

[52] **U.S. Cl.** **72/93**; 72/92; 384/626; 140/147; 29/125

[58] **Field of Search** ..... 72/91–94, 72/160, 462, 180; 140/147; 384/626; 16/19, 47, 248, DIG. 39; 29/125, 130

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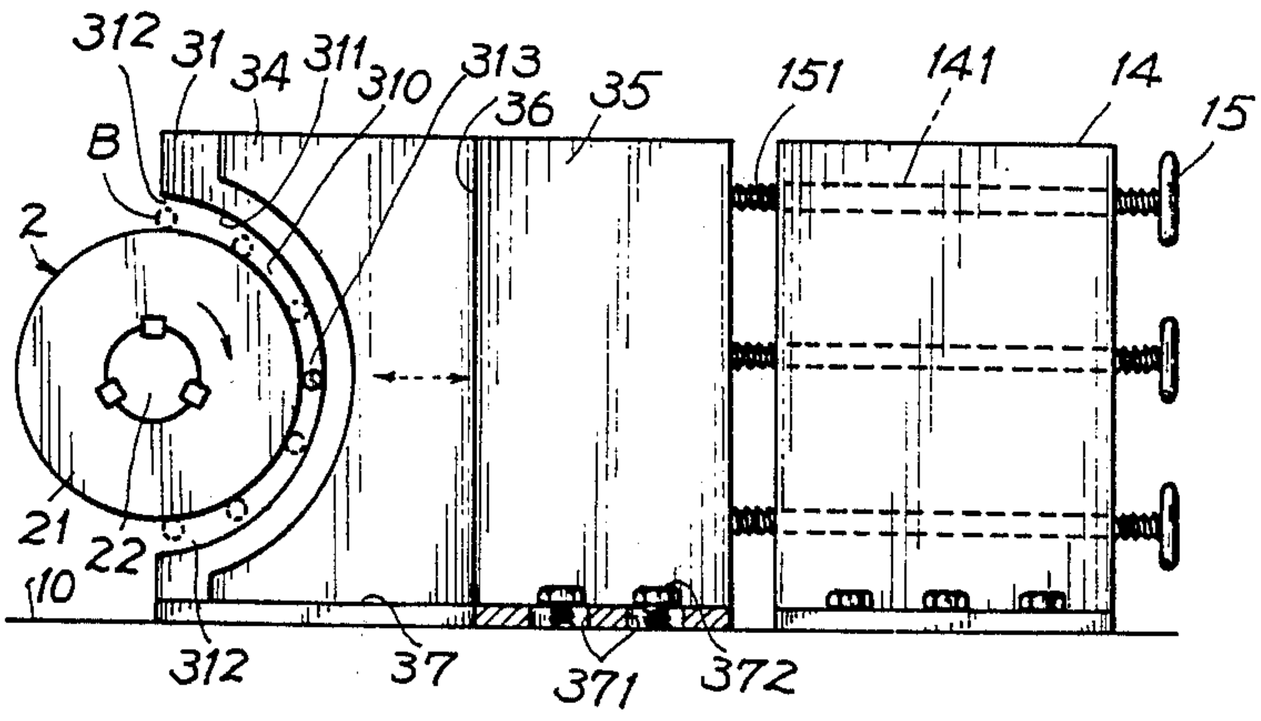
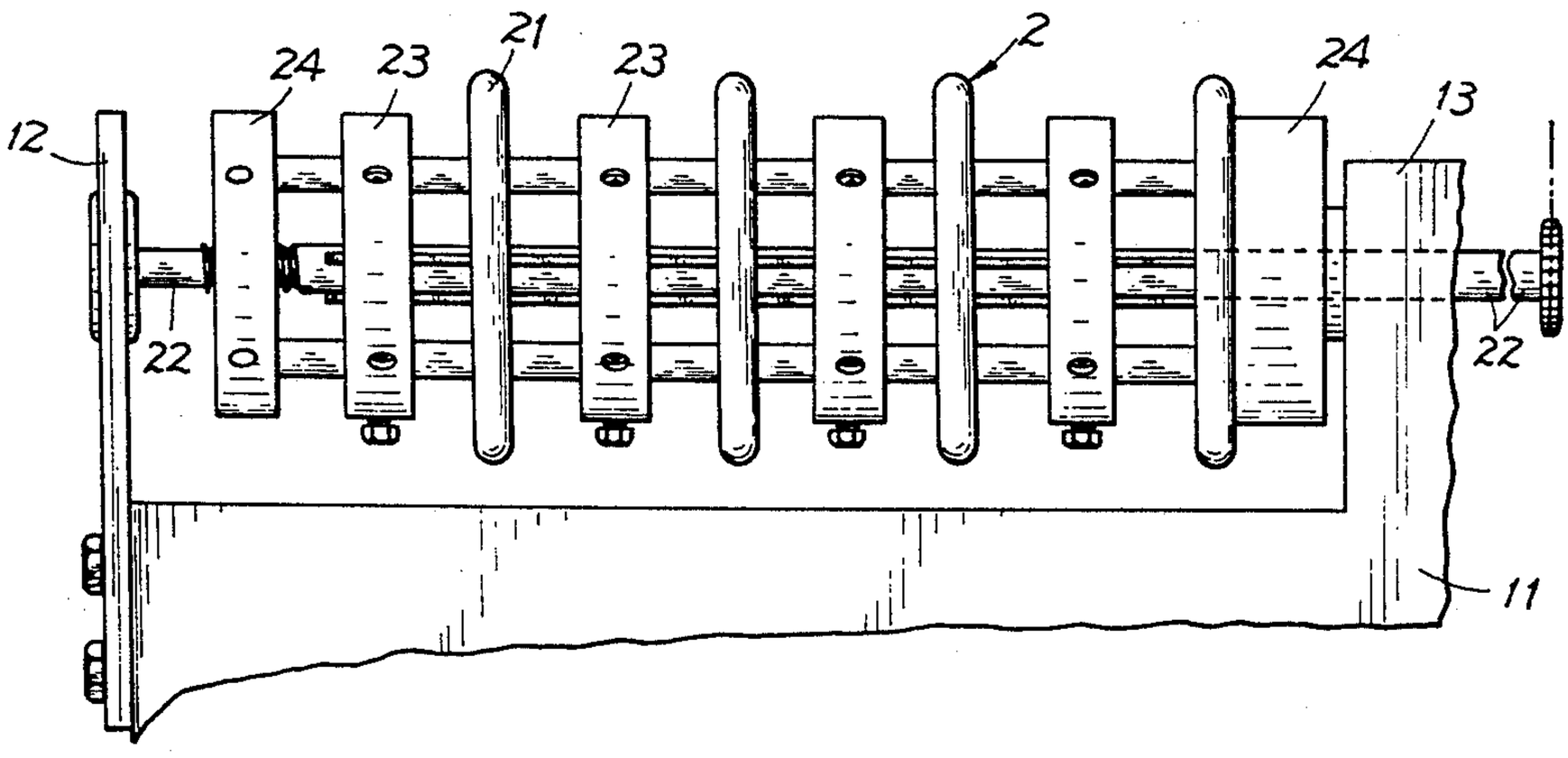
Primary Examiner—Robert L. Spruill

[57] **ABSTRACT**

A straightener for straightening longitudinal cylindrical bars includes: a machine body, a driving wheel unit having plural driving wheels rotatably mounted on one side of the machine body, an idle plate assembly having plural idle plates retained on the opposite side of the machine body interlacedly facing the plural driving wheels, and a driving motor for driving the driving wheels, so that upon a transverse feeding of a deformed bar into a slit defined by the driving wheels and the idle plates and rotating the wheels as driven by the motor, the bar can be arcuately moved downwardly through the arcuate slit and rotatively bitten by the wheels and the idle plates to straighten the bar.

1 Claim, 3 Drawing Sheets





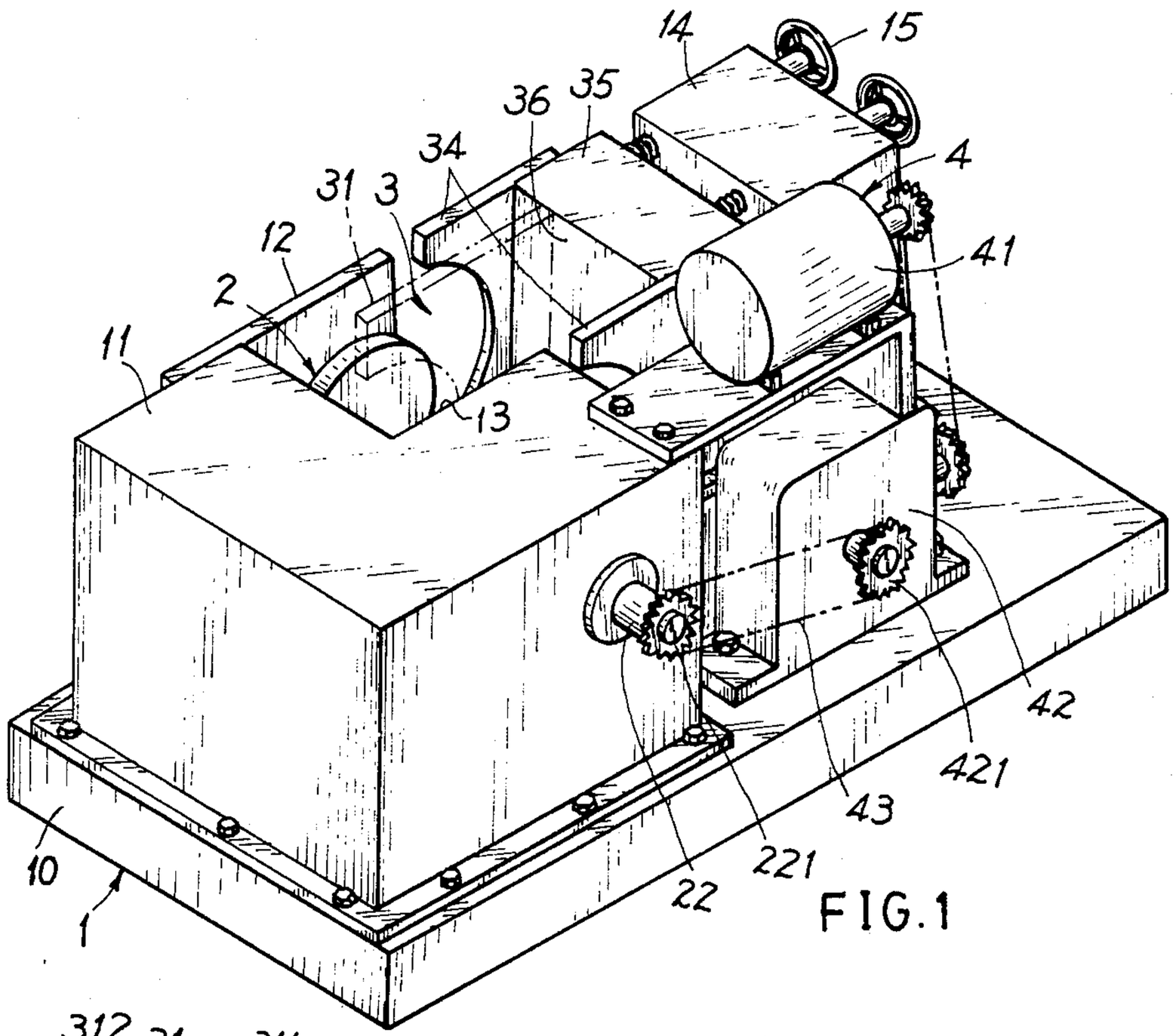


FIG.1

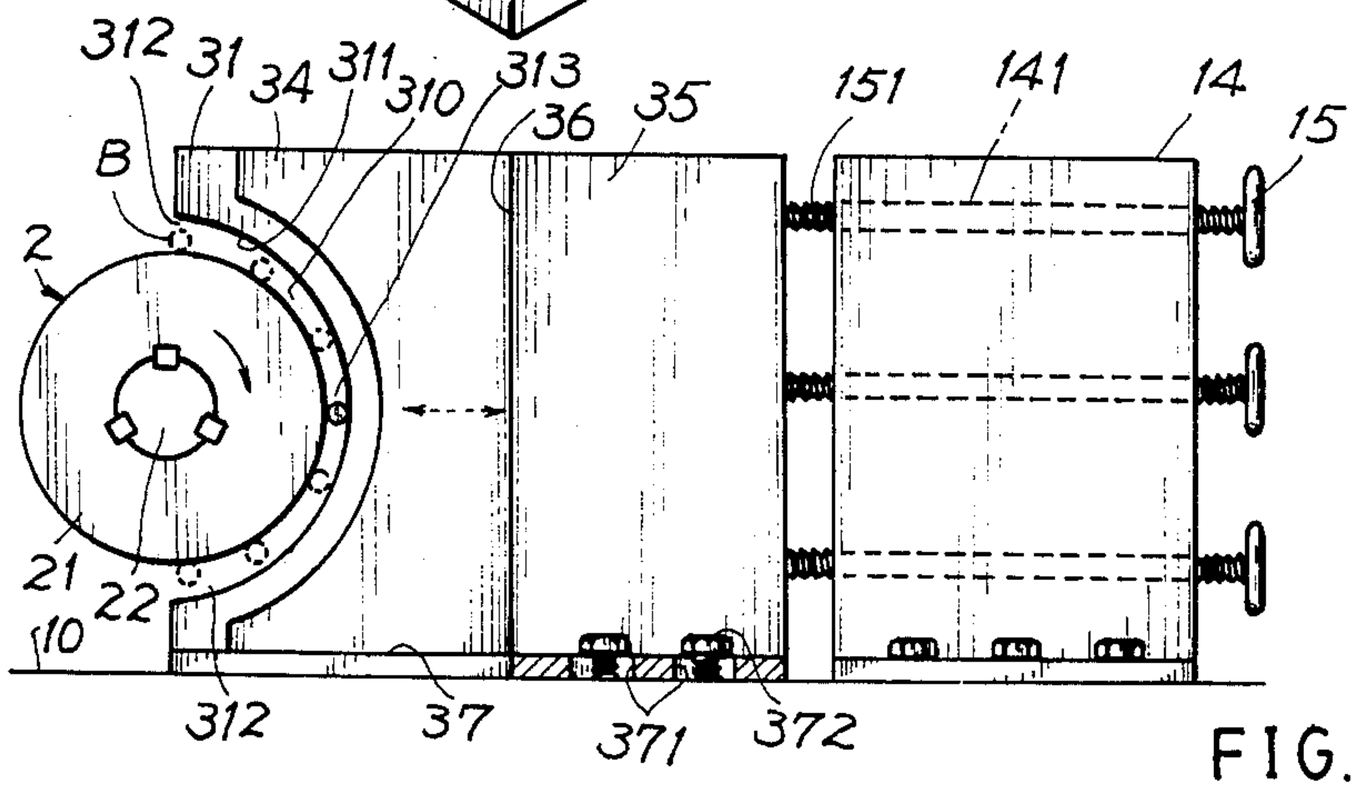


FIG.2

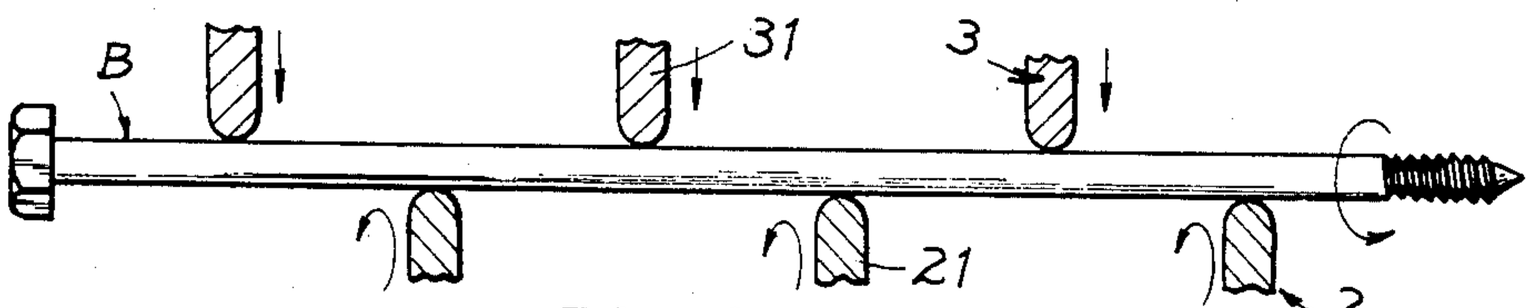


FIG.3

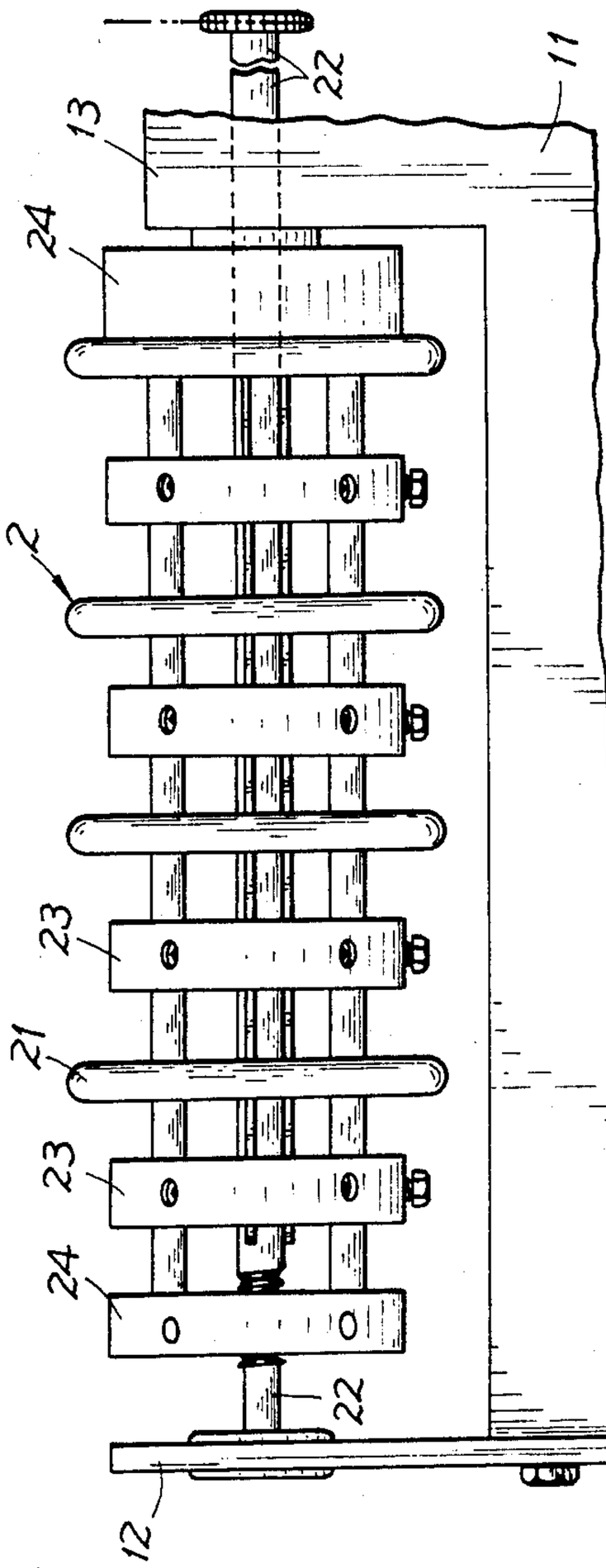

1
22
11
13
24
2
23
21
23
24
22
12

FIG. 4

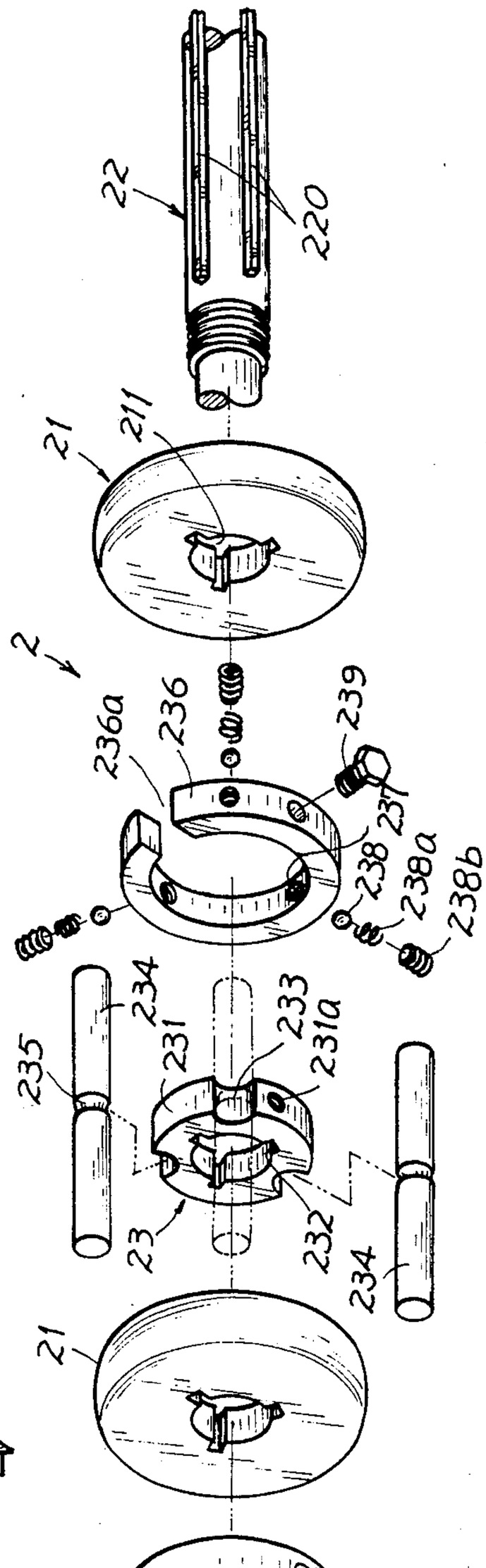

22
220
211
21
2
2360
236
239
237
238
238a
238b
234
233
231
231a
235
23
232
234
21
24

FIG. 5

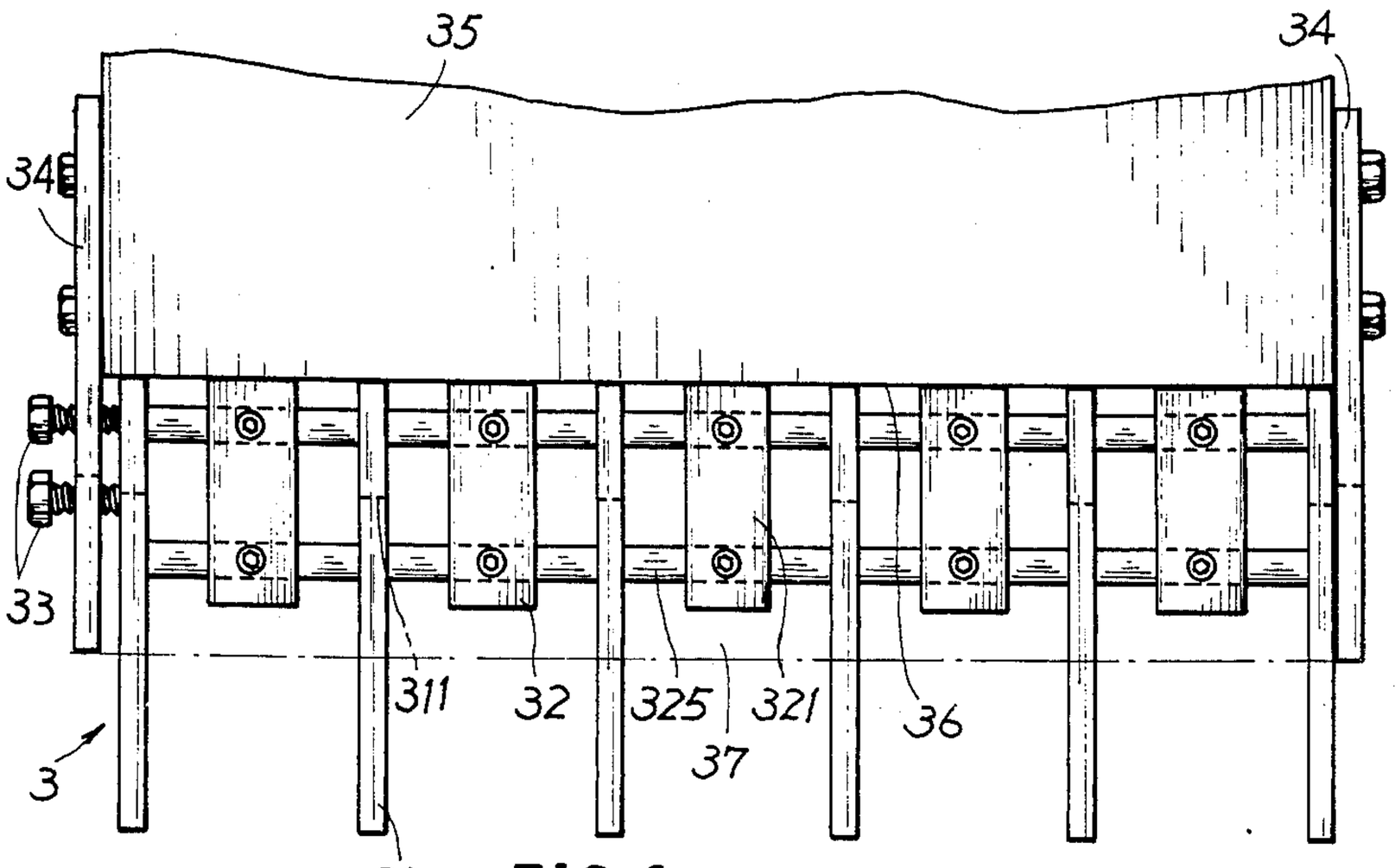

35
34
34
33
311
32
325
321
37
36
3
31

FIG. 6

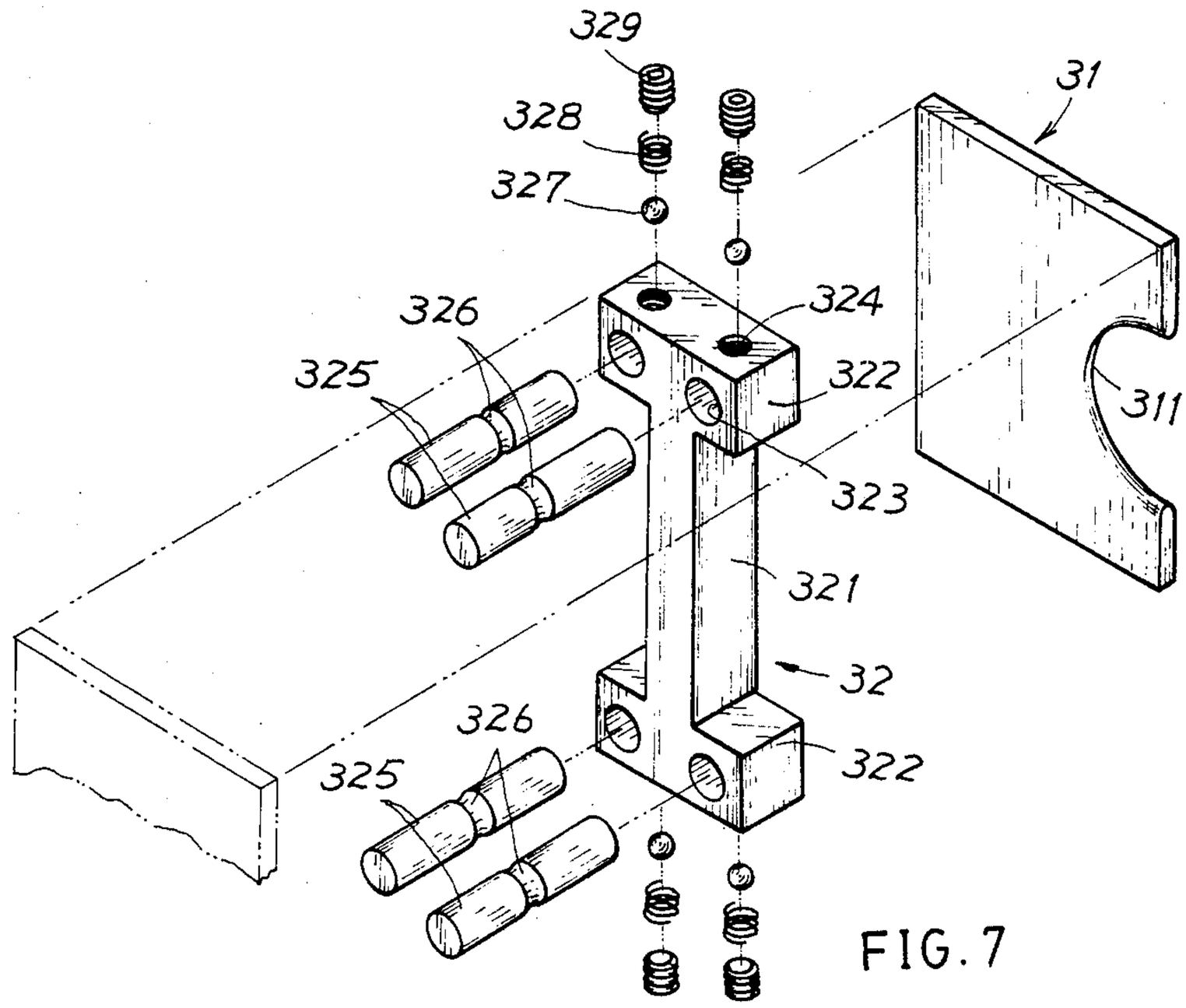

329
328
327
326
325
324
322
323
321
32
326
325
322
31
311

FIG. 7

WHEEL-DRIVING STRAIGHTENER FOR STRAIGHTENING LONGITUDINAL CYLINDRICAL MEMBER

BACKGROUND OF THE INVENTION

A rotary type straightener may be used to straighten a cold-drawn annealed tube and consists of rolls set with axes oblique with the pass line. These rolls are somewhat smaller in the center than at the ends to afford a line contact with the tube, which passes between the two driven rolls on one side and the three idle rolls on the other. The tube is helically advanced by the rolls which are adjusted to bend the tube progressively as it moves through the machine. Since the tube to be straightened is advanced by the oblique rolls, the tube must preclude any extension transversely formed on the tube. Therefore, a bolt with screw head can not be straightened by such a conventional rotary type straightener.

The present invention has found the drawback of a conventional rotary type straightener and invented the present wheel-driving straightener, especially suitable for straightening a screw bolt.

SUMMARY OF THE INVENTION

The oject of the present invention is to provide a straightener including: a machine body, a driving wheel unit having plural driving wheels rotatably mounted on one side of the machine body, an idle plate assembly having plural idle plates retained on the other side of the machine body interlacedly facing the plural driving wheels and a driving motor driving the wheels, whereby upon the feeding of a deformed screw bolt, after a heat treatment such a quenching process, into an arcuate slit operatively defined between the driving wheels and the idle plates, the bolt will be straightened effectively as rotatably bitten between the rotating driving wheels and the idle plates.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective illustration of the present invention.

FIG. **2** is a side-view illustration of the present invention.

FIG. **3** is an illustration showing a bolt operatively straigtened between the driving wheels and the idle plates in accordance with the present invention.

FIG. **4** is a top-view illustration of the driving wheel unit of the present invention.

FIG. **5** is an illustration partially showing the elements of the driving wheel unit of the present invention.

FIG. **6** is a top-view illustration of the idle plate assembly of the present invention.

FIG. **7** is a partial perspective illustration showing the elements of the idle plate assembly of the present invention.

DETAILED DESCRIPTION

As shown in the figures, the present invention comprises: a machine body **1**, a driving wheel unit **2**, an idle plate assembly **3** and a driving motor means **4**.

The machine body **1** includes: a base portion **10**, a left frame **11** having two side brackets **12, 13** for rotatably mounting the driving wheel unit **2**, and a right frame **4** having plural adjusting bolts **15** formed therein for adjusting the idle plate assembly **3** adjustably mounted on the base portion **10** of the body **1**. Each bolt **15** is formed

male-threaded portion **151** to engage with a female-threaded hole **141** in frame **14**.

The driving motor means **4** includes: a driving motor **41** mounted on the machine body **1**, a gear box **42** for reducing the rotation speed of the motor having an output gear **421**, and a transmission chain **43** coupling the motor gear **421** to an input gear **221** of a driving shaft.

The driving wheel unit **2** includes: plural annular wheel members **21** mounted on a driving shaft **22**, plural wheel-space adjusting means **23** each partitioning every two neighboring wheel members **21**, and two retaining disks **24** secured on two opposite end portions of the shaft **22** to limit the wheel members **21** and the space adjusting means **23** therebetween.

Each annular wheel member **21** is formed with three axially extending grooves on its inner periphery to engage with triple longitudinal extensions **220** radially formed on the shaft **22** to thereby slidingly mount the wheel member **21** on the shaft **22**.

Each wheel-space adjusting means **23** includes: an inner annular disk **231** having three axially extending grooves **232** on its inner periphery of the disk **231** to slidingly engage with the triple extensions **220** of shaft **22** and having three notches **233** radially formed on a periphery of the disk **231**, three spacing bars **234** each having a central ring groove **235** circumferentially formed on each bar around a longitudinal axis of the bar and each bar **234** snugly mounted in each notch **233** on the disk **231**, and a fastening collar **236** having an opening **236***a* formed on the collar **236** slightly larger than a diameter of each bar **234** disposing around and securing the bars **234** with the disk **231** by fixing a screw **239** through the collar into a scrw hole **231**a formed on the disk **231**.

The collar **236** is provided three holes **237** therethrough, each hole being inserted with a steel ball **238** which is retained by a spring **238***a* and a threaded plug **238***b* in the collar **236** to rotatively engage each ball **238** with each ring groove **235** formed on each bar **234** so that the collar **236** can be rotated to deviate the collar opening **236***a* from the bar **234** to fix the bar on the disk **231** and can be rotated to coincide the opening **236***a* with the bar **234** so that a bar can be taken out through the opening **236***a* for replacing with another bar of different length, for adjusting the space between every two wheel members **21** corresponding to the processing article B to be straightened by this invention.

The idle plate assembly **3** includes: plural idle plates **31** each plate **31** formed as generally rectangular shape having a semicircular recess **311** formed on a central portion of each plate **31**, and plural plate-space adjusting means **32** each positioned between every two neighboring plates **31** and each backing on a vertical surface **36** and standing on a bottom plate **37** of a L-shaped block **35** adjustably mounted on a base portion **10** of the machine body **1**. The plural plates **31** are retained between two side plates **34** formed on the block **35** as clamped by plural fastening bolts **33** adjustably mounted on the side plate **34**. The bottom plate **37** of block **35** is formed with several longitudinal slits **371** and several screws **372** are each provided through each slit **371** to adjust the frontward or rearward position of the block **35** and the plates **31** mounted thereon on shown in FIG. **2**.

The idle plates **31** are juxtaposedly retained on the block **35** on the base portion **10** in front of the right

frame **14** to be axially offset from and facing the plural wheel members **21** as juxtaposedly mounted on the shaft **22** rotatably mounted on the side brackets **12, 13** of the left frame **11** on the base portion **10** as shown in FIG. **3** and **2**. The semi-circular recess **311** of the idle plate **31** has a diameter slightly larger than a diameter of the wheel member **2**. An arcuate slit **30** having a space slightly larger than a diameter of a bolt B to be processed is operatively defined between the wheel member **21** and the recess **311**, which includes two enlarged ports **312** gradually diverged from a central tightening slit portion **313** having a space equal or slightly smaller than the diameter of the straightened bolt B positioned at the central point of the recess **311**, as shown in FIG. **2**.

The plate-space adjusting means **32** includes: an I-shaped plate **321** having two horizontal levers **322** respectively formed on an upper and a bottom portion of the plate **321**, each lever **322** formed two horizontal holes **323** and two vertical screw holes **324** in the lever **322**; and four spacing bars **325** each formed a central ring groove **326** thereon respectively inserted in the horizontal holes **323** formed on the upper and bottom levers **322**. Each bar **325** is inserted into each horizontal hole **323** and is retained therein by engaging a steel ball **327** as held in the vertical hole **324** as restored by a spring **328** limited by a threaded plug **329** fixed in the hole **324**. When it is intended to adjust the space between the neighboring plates **31** corresponding to a bolt length to be straightened, the spacing bars **325** can be withdrawn from the holes **323** when loosening the threaded plug **329**.

When using the present invention for straightening a cylindrical member such as: a bolt, a bar or the like, a deformed bolt B is transversely fed into the upper enlarged port **312** as shown in FIG. **2** and the motor is running to rotate the wheel members **21** clockwise to operatively force the bolt B being processed to cause the bolt to rotate counterclockwise and arcuately moving downwardly along each recess **311** of the idle plate **31**. By moving the bolt from upper enlarged port **312** through middle tightening slit portion **313** to the lower enlarged port **312** of the arcuate slit **310** as defined between the wheels **21** and the idle plates **31**, the deformed bolt B will be straightened by mutual bending and straightening operation as effected by the driving wheel set **2** and the corresponding idle plate set **3**.

For processing bolts of different diameters, the adjusting bolts **15** can be operated to move the idle plates **3** either frontwardly or rearwardly in commensuration with the driving wheels **2**. For suiting bolts of different length, the spacing bars **234** or **325** of the driving wheel unit **2** or the idle plate assembly can be replaced or changed for optimum processing therefor. For instance, a shorter bolt can be straightened by selecting a narrow spacing between every two wheels **21** or idle plates **31**.

Accordingly, the present invention has the following advantages superior to a conventional rotary type straightener:

1. The bolt or cylindrical rod can be transversely fed into the slit between the wheels **21** and the idle plates **31** and circulatively straightened downwardly, other than a horizontal advancing operation, so that any bolt or rod having screw head or extending portion formed thereon can be straightened since the extending portion can be put into the space between the neighboring wheels **21** or plates **31** and will not be rolled or squeezed during the processing.

2. Straightening operation is performed in a circular motion to thereby save the operation space and construction cost, without building a longer straightening line as found in a conventional rotary straightener.

3. For adjusting the space between the neighboring wheels **21**, it is simply done by rotating the collar **236** to coincide the opening **236***a* with the spacing bar **234** for easier replacing operation without overall dismantling the shaft **22**, the wheels **21** and the adjusting means **23**.

I claim:

1. A wheel-driving straightener for straightening longitudinal cylindrical member comprising:

a machine body having a base portion, a left frame having two side brackets formed on a left portion on said base portion, and a right frame having plural adjusting bolts formed through said right frame formed on a right portion on said base portion;

a driving wheel unit having a plurality of annular wheel members juxtaposedly mounted on a driving shaft rotatably mounted on said two side brackets of said left frame, and having plural wheel-space adjusting means mounted on said driving shaft each wheel-space adjusting means partitioned between every two neighboring wheel members, said driving shaft driven by a driving motor means mounted on said machine body; and

an idle plate assembly having a plurality of idle plates each idle plate having a semi-circular recess formed on a front portion of said idle plate generally shaped as rectangular, said idle plates juxtaposedly retained on a block adjustably mounted on said base portion and adjusted toward and away from said driving wheel unit by said adjusting bolts formed on said right frame, said idle plates being axially offset from and facing said plural wheel members and operatively defining an arcuate slit between the driving wheel unit and the idle plate assembly for the transverse insertion of a cylindrical member to be straigtened into said arcuate slit, every two said idle plates partitioned by a plate-space adjusting means and fastened on said block for retaining said idle plates in said block, whereby upon the rotation of the wheel members as driven by said driving motor means, a cylindrical member being straightened is operatively bitten between the wheel members and the idle plates and arcuately moving downwardly for its straightening;

said plurality of annular wheel members being formed with three axially extending grooves on the inner periphery thereof engageable with triple longitudinal extensions radially formed on said driving shaft;

the improvement which comprises:

said wheel-space adjusting means including an inner annular disk having three axially extending grooves on its inner periphery slidingly engaged with the triple extensions in said driving shaft, plural spacing bars mounted on plural notches circumferentially formed on the inner disk, and a fastening collar securing said spacing bars on said inner disk and having a radially extending opening larger than a diameter of the spacing bars for selectively coinciding with said bars for replacement with other bars of different length through said collar opening.

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